VEDANTA AND MODERN PHYSICS

Dr. U. Chandrasekharayya

One is amazed at the broad sweep of the contents of the book 'Vedanta and Modern Physics' and the erudite manner in which the various topics have been handled and critical assessments made. What is most impressive is the thoroughness with which appropriate references have been made to the ancient texts in Sanskrit citing large numbers of quotations from the Upanishadas, the Bhaghavat Gita and other Indian sources of information and authority. What is equally pleasing is the effort that has been made by the author to give adequate references to scientific works also incorporate quotations from leading physicists like Einstein, Schrodinger, Dirac, Heisenberg and a host of others - most whom are Nobel Laureates and founders of the fields of Relativity and Quantum mechanics. The vital, crucial and sensitive concepts like space, time, causality, reality, appearance, illusion etc. have been handled with utmost care and clarity both from the modern physics point of view and from the point of view of Vedanta. The current position regarding these on the basis of quantum mechanics and relativity in physics and from considerations of the three status of experience in Vedanta, and the role of "observer" (consciousness) in quantum physics and of the witness or the "knower" in Vedanta have been brought out without any ambiguity, highlighting their importance.

I have rarely come across a book especially by an Indian author which has such wide coverage of topics presented with authentic references and quotations both in English and Sanskrit.

- Dr. B.V. Sreekantan

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By
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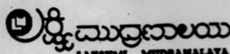
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FOREWORD

Modern science which may be said to have its beginning about 400 years ago followed the path of reductionism and classical physics initiated by Newton and was eminently successful in explaining a wide range of phenomena observed in nature. However towards the end of the 19th century and early 20th, several new phenomena were experimentally observed which could not be explained within the frame work of classical physics which necessitated the advent of two radically new theories, relativity and quantum mechanics. These two theories completely transformed our ideas of space, time and causality and most importantly brought in the connection between consciousness and physical reality. The recognition of existence of a substratum from which everything arises and which connects everything to everything else in the universe - later identified as the quantum mechanical vacuum and which was also the four dimension space-time continuum in the theory of relativity, was an unavoidable but exciting consequence of these developments. These findings of modern science, in particular the concept of "oneness" has echoes in many of the ancient philosophical insights, one of the earliest being the Vedantic insight which forms the core of the Advaita Philosophy of Shankaracharya.

It is in this contest and setting that this book which is based on the Ph.D. thesis of Dr. U. Chandrasekharayya entitled "An inquiry into the Approaches to Natural Reality in Vedanta and Science with Special Reference to Adwaita Vedanta and Modern Physics" has to be looked at.

One is amazed at the broad sweep of the contents of the book 'Vedanta and Modern Physics' and the erudite manner in which the various topics have been handled and critical assessments made. What is most impressive is the thoroughness with which appropriate references have been made to the ancient texts in Sanskrit citing large numbers of quotations from the Upanishadas, the Bhaghavat Gita

and other Indian sources of information and authority. What is equally pleasing is the effort that has been made by the author to give adequate references to scientific works also incorporate quotations from leading physicists like Einstein, Schrodinger, Dirac, Heisenberg and a host of others - most whom are Nobel Laureates and founders of the fields of Relativity and Quantum mechanics. The vital, crucial and sensitive concepts like space, time, causality, reality, appearance, illusion etc. have been handled with utmost care and clarity both from the modern physics point of view and from the point of view of Vedanta. The current position regarding these on the basis of quantum mechanics and relativity in physics and from considerations of the three status of experience in Vedanta, and the role of "observer" (consciousness) in quantum physics and of the witness or the "knower" in Vedanta have been brought out without any ambiguity, highlighting their importance.

Though Dr. Chandrasekharayya has put across a particular point of view and has justified the same with sound arguments, this view may not be accepted by all since it does fall in a highly controversial area, and the methodologies of science and ancient systems of philosophy are widely different. While many can more easily accept the value of almost identical end results and the corresponding parallelism of insights, they do become skeptical if similarities are claimed in details, however convincing they may be. The value of this book is the unbiased discussion of the details at various levels too. Each path that takes us to the top of the Mount Everest is equally interesting. However different the paths may be, there will be some similarities which draw our special attention. These detailed comparisons have a significance of their own as becomes evident by going through the book.

The book has a large content of valuable information both in terms of philosophy and science and it will serve as a reference book to the professionals as well as young readers. I have rarely come across a book especially by an Indian author which has such wide coverage of topics presented with authentic references and quotations both in English and Sanskrit.

B.V. Sreekantan

Bangalore
20-2-2006

AUTHOR'S WORD

The world is so nearly hypnotized by the glamours of scientific technology that it has forgotten to ask the question what science should really mean to man. The answer, however, is nowhere to be found within the bounds of the vast studies of nature made by the genius of our race, for the objective approach of science by its very definition prevents the inclusion of man in its domain in any essential way. Despite only the partial picture of nature it can present, -a feature sufficient to falsify its claim to the status of truth, -science has commended itself to the present generation as the touchstone of truth, thus unfortunately proving itself dangerous, if adopted as a doctrine of life. For what science puts before us is only a sensori-egocentric view of the world when its knowledge is not subjected to a higher censorship from the spiritual standpoint. So powerful is this knowledge called science that if all the blessings of modern civilization could be traced to its achievements, all the ills of modern civilization too could be traced to the spell of the mechanistic outlook which it has cast on the mind of man. And yet surely, it cannot be the scientific knowledge in itself that is at fault, but rather a misreading of it as a holy decree to rule our life and shape our aspirations and values that has put us on a wrong footing. The world which is avidly exploiting the Matter-Energy equation of Einstein is blissfully ignorant of the deep insight of this pioneer of modern science who clearly saw the inadequacy of objective science for being the guiding principle of life. Here is Einstein looking beyond science for a goal and value in the life of man:

"Objective knowledge provides us with -powerful intruments for the achievements of certain ends, but the ultimate goal itself and the longing to reach it must come from another source." (P. 42, Ideas and Opinions).

This "another source" is in the direction of our own soul, which, by virtue of its conscious nature, is the author of all scientific knowledge too.

The powerful wave of scientific materialism sweeeping the world today could be contained only by an equally powerful counter-wave of scientific spiritualism which can establish the life of the soul in its own right, and also show that it could absorb the science of matter as an aspect of its larger integrated system. Thus, we need a science of the soul -of the spirit -of Consciousness, which is, in its credibility, on a par with modern science, and has the power to re-interpret it giving it a new dimension of positive values, and put it in its righful place. Science is not enough for life simply because scientific facts do not teach reverence for life, nor do they inspire in us devotion to truth, I mean, to the whole truth. The modern poet laments over the situation brought about by modern science:

The endless cycle of idea and action,
Endless invention, endless experiment,
Brings knowledge of motion, but not of stillness;
Knowledge of speech, but not of silence; ......
All our knowledge brings us nearer to our ignorance, ...
Where is the life we have lost in living?
Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?

(T.S. Eliot, Choruses from 'The Rock')

Is there a solution?

The world will find it sooner or later that the solution for the ills of scientific civilization lies in the wisdom of the Upanishads, and its rational appeal gifted to it by Shankaracharya, which should hopefully lead us back (or forward!) though not quite to the Vedic way of life but to the Vedic view of life, whose singular motto is

THE GOOD OF ALL THE WORLDS

"Lokah samasthah sukhino bhavanthu"

The thesis could be the outcome of these sentiments, -I am not sure.

N.B. I have often used long quotations from authors, especially on physics, so as to keep their interpretations of physical facts unchanged rather than undertaking to interpret them myself. The correlation part of the work between Vedanta and physics is, however, entirely mine. It has been possible to find the ABSTRACT of the thesis in Shankara's own writings, which shows that what Shankara establishes in his philosophy is the difference between the sensori-egocentric (Vyavaharika) view of the universe which is coincident with the scientific world-view, and the absolute (paramarthika) view of reality.

U. CHANDRASEKHARAYYA

ABSTRACT :

The concept of reality (Brahman) in Vedanta is formulated in two ways:

In relation to our impressions derived from matter, its various transformations, and the instruments of perception (including the mind) designed out of it, Brahman is described as omniscient, omnipotent etc. This is the Brahman, which, falling within the sphere of causality, stands as the basis of all our empirical dealings and enters into our discourse. The selfsame Brahman, when realised from the absolute point of view as dissociated from all frames of reference is said to be beyond speech and mind, being unborn, timeless, immortal, and abiding in complete fearlessness. Since it is a non-dual Reality, it cannot be the object of mind and speech, and is therefore, spoken of in terms of negation -"Not this", "Not this". (Brihadaranyaka Upanishad, II. III. 1).

The thesis is an attempt to show that the model of reality which physics has been developing over the last 300 years is fast approaching this relativistic model of reality evolved in Vedanta philosophy by Shankaracharya.

तत्र द्विरूपं ब्रह्म पंचभूतजनितकार्यकरणसम्बद्धं मूर्तामूर्ताख्यं मर्त्यामृतस्वभावं तज्जनितवासनारूपं च सर्वज्ञं सर्वशक्ति सोपाख्यं भवति । क्रियाकारकफलात्मकं च सर्वव्यवहारास्पदम् । तदेव ब्रह्म विगत सर्वोपाधिविशेषं सम्यग्दर्शनविषयम्, अजम्, अजरम्, अमृतम्, अभयम् वाङ्मनसयोरप्यविषयम्, अद्वैतत्वात् ''नेति'' ''नेति'' निर्दिश्यते इति ।।

Br.Up. II. III. 1.

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CONTENTS

INTRODUCTION

In this essay I have made an attempt to link the ancient knowledge of the Upanishads with the developments in modern science which have taken place in the context of its investigation of physical nature. The spokesman I have preferred among the many that are available for the Upanishadic philosophy is Shankaracharya, whose exposition; I feel) displays a clear scientific temper in methodology coupled with a fearless pursuit of truth to its ultimate logical conclusions. As for modern science, two or three distinguished names suggest themselves to me -Einstein, Heisenberg and Schrodinger. Here, of course: there is a fairly long list of names whose reflections upon the meaning of modern science I have drawn upon: these are Hermann Weyl, Eddigton, Neils Bohr, Max Born, James Jeans, Reichenbach, Frank Philip, Bronowski and indeed, a host of other knowledgeable persons in the field. Although I am painfully aware of the deprivation on my part of the facility of making a more precise and technical presentation of the ideas of physics, which is afforded only by a knowledge of mathematics. I am not dissuaded from approaching it from a philosophical point of view, simply because I have felt for certain that even in a layman's understanding of this branch of science, its profound philosophical significance cannot go unnoticed. Such an obvious philosophical significance on the part of a physical science arises because of a fundamental connection between physics and Vedanta: Physics is exploring the physical universe while Vedanta makes an inquiry into the first cause of

this universe. Of course, Vedanta in its all-inclusive approach, includes mind and consciousness too; but it is to be noted that it does not exclude the world of matter, which is the prime object of the physicist's investigation. Therefore, it is but natural that the science of Vedanta and the science of physics should have bearing on each other, not just of a superficial kind but of some essential type. How shall we construe this relationship between Vedanta and Physics? An analogy will help: the world of spirit (or consciousness) intuitively realised in Vedanta and the world of matter empirically studied in physics resemble a two-storeyed structure raised upon a common basement, where the latter is superimposed upon the former. While all the details in the two apartments may not precisely compare, there is so much agreement in their design as to show that they are parts of a single plan on which the building as a whole is modelled. This building is the universe, apparently composed of both consciousness and matter, and wrought into an organic unity by definite laws of universal validity. Therefore, it is not only that the ultimate explanation of the existence of matter must be sought in the underlying spiritual nature of things, chiefly of man himself, but even in constructing the models of observed or experienced realities, I feel it would be useful to take one's cue from either of the subjects to the other.

Terming it curious that modern scientific knowledge coincides with what the old philosopher taught, Swami Vivekananda says, "It must be so, and that is the proof of truth. They proceeded in their inquiry, taking up mind as the basis; they analysed the mental part of this universe and came to certain conclusions, which we, analysing the physical part, must come to, for they both must lead to the same centre" (CW.Vol.II, p.443).

The object of investigation in Vedanta, as Shankara defines it, is the First Cause which has given birth to a universe regulated

by the laws of time, space and causation, and which provides the ground of experience for beings endowed with consciousness (B.S. I. 1.2). [1]

In support of this contention, we might further examine the two disciplines in respect of the epistemological principles underlying their methodology- One such well known basic principle in science is the process of **objectivization,** which aims at making observation as independent of the individual observer as possible. Under this principle, the physicist studies matter for its own sake freeing it from the subjectivity of perception as far as possible. The observer is isolated from the observed in the attempt to attain objectivity. The external world is known to us through its interaction with our minds, but our mental characteristics must leave no stamp of their own on the object given to our knowledge in the process of this interaction. We have to determine what the object is in itself. The same principle but in a counter process is what is in point for Vedanta. Here, of the two factors, mind and matter interacting in the knowing process, mind is studied for its own sake. Consciousness, which is really the essence of mind is recognized as an entity in itself. The technique is to study consciousness in abstraction, that is, freeing it from its association with matter. Consciousness freed from the cramps of matter would attain its normal dimension. This kind of study of consciousness is in principle, the same as the objective study of matter undertaken by the physicist, although the term objective may not be suitable to describe the approach. Nevertheless, studying consciousness in itself conforms to the objectivity criterion set by the physicist and yields an equally valid result. The empirical laboratory method of the scientist and the intuitive-introspective method of the Vedantin make no difference as far as objectively valid results are

concerned in this investigation. To claim that under the same principle of objectivisation physics studies matter and Vedanta explores mind and consciousness may sound paradoxical, for mind is no object of common observation like matter. Moreover, the very notion of subjectivism is conceived with reference to the minds of individuals and what is available even to introspection is only the private mind of the individual. How, then, could one associate the notion of objectivity with regard to our knowledge of mind and consciousness? As a solution to this problem, Shankara has carefully evolved the **principle of Vasthu Tantra,** or what might be called the **factual approach** to reality. While a fuller explanation of this important principle will be given later, I should like to mention the main difference between the Vasthu Tantra of Shankara and the objectivity criterion of the physicist. The objectivity criterion of the physicist is conceptually vitiated by the relativism it involves in so far as it is an antithesis to subjectivity. Furthermore', of late, it has been demonstrated that the degree of objectivity supposed to be attainable in classical mechanics cannot be attained in the quantum mechanical experiments. In this new situation, the observer's role is seen to change from one of spectator to that of participator. With his characteristic thoroughness in the logical apprehension of issues, Shankara is seen to circumvent this contigency faced by the modern physicist. He declares that the knowledge of object (reality) must not depend on what the knower does or not does. According to him, that knowledge which is subject to the activities of the human mind cannot be true knowledge because any activity (instituted into the knowing process) must necessarily be independent of the nature of the object to be known[2]. Such an activity always proceeds from the point of view of the subject or the knower. The stand taken here is that for attaining full objectivity

in knowledge neither the sensory mode of perception nor any sort of mental activity can provide an adequate basis. It could be readily seen how meticulously and with what discernment Shankara formulates his chief principle of epistemology, the counterpart of the principle of objectivization in modern science. I do not think that in its conceptual purity the principle of objectivity can be carried any further. In condemning every sort of mental activity as carrying the tinge of subjectivity in the act of apprehension of the object (reality), Shankara keeps his basic epistemological principle consonant with the conception of reality presented in the Upanishads; for reality, according to the Upanishads, lies beyond the reach of mind and senses. In fairness to the scientist, we should maintain that the scientist is not really averse to the study of consciousness; but the principle of objectivization in his methodology, as he has so far formulated it, simply does not permit him to admit consciousness as a datum into his somewhat rigidly conceived discipline. Perhaps, we may have to wait for long for the physicist to take his objectivity principle on his own terms to the point of thoroughness as reached by the Vedantin; however, we can see the beginnings of the physicist's struggle in this direction after the advent of quantum mechanics. The formulation of a new epistemology of science is already on the anvil.

Any further consideration of how such a formidable-looking principle of epistemology as mentioned above (Vasthu Tantra) has been given effect in Advaita Vedanta would at once land us in the deep waters of metaphysics. Leaving this, therefore, for future discussion, we would rather look for the results of applying this principle to our experience. In so far as both the principle of objectivization in physics and tre Vasthu Tantra in Vedanta are

designed to eliminate the element of subjectivity from our knowledge of the object, they come under the same category. In the first phase of its development, the systems- philosophy (Nyaya, Vaisheshika, Samkhya, etc.) clearly exhibits those very objective characteristics of external nature which are categorised by science in his study of the same phenomenon. The atomic theory of the Vaisesika, and the concept of prakriti or the Primordial Nature in Samkhya, for instance, are thoroughly founded on an objective view of nature. In the further course of its evolution, the systems-philosophy, —we are looking at it as one integral system passing through various phases of its development, —comes to be called Vedanta and here in the hands of Shankara, the principle of objectivity is carried to its ultimate logical conclusions.

The scientific man of today would appreciate Shankara's approach to philosophy only if he could see that Shankara applies the principle of objectivity in his analysis of the subject or observer. The evolution of the **concept of Sakshi**[3] or the witness-consciousness, with all the elements of subjectivity shed from the observer (pramatr) is the result of a fruitful application of Vasthu Tantra (objectivity principle) to the domain of the subject. Such an objective concept of the observer is also the ideal of the physicist, which he visualizes in the notion of the inertial frame. In the world of philosophy, however, we do not see the concept of Sakshi being evolved anywhere else, and I should venture to add that the institution of the Sakshi concept into the methods of philosophical inquiry is a singular and unique achievement of Shankara.

Despite its thorough-going scientific character in conception and development, Vedanta has not commended itself sufficiently to the world community, which has come under the impact of

modern science. This lapse on the part of a world taking great strides in knowledge seems a little strange when we consider that these two disciplines have so much in common in their content as to naturally link up in minds pursuing creativity in knowledge. There is a scientific spirit in Vedanta and there is a spiritual strain hidden in science, but both these aspects, by a strange turn of history, have suffered obscuration in the modern world. This unfortunate occurrence is a sign of superficiality in the vision of man: for most people see only religion in Vedanta and materialism in science. The circumstances of the birth of European science also partly contributed to give it a mask of materialism as opposed to the religious spirit. Its colossal achievements in technology and its enormous contribution to the increase of our bodily comfort has made physical science stand in the popular mind only for materialistic values, having no bearing on the spiritual side of human life. Moreover, it took its first forward leap only after a sustained struggle against the religious obscurantism of the Europe of the Middle Ages, and therefore, when it came to India, it bore and perhaps still bears for most of its recipients the stamp of its anti-religious stance. If some of the votaries of science do not actually visualize an antithesis between science and religion, they at least pretend to see in science a natural irrelevance to religion and philosophy. For many an unreflective soul, the conquest of science over the forces of nature has provided a sufficient ground to derive all interpretation of life and nature from it, which they fancy is truly a scientific view of life. Indian philosophy in general, is an integral part of its religion, because, here religion contains nothing of an unscientific temper in it. There has never been a conflict between religion and science in India. In the West, it is altogether a different story: There religion was mainly anthropomorphic in its conception and it clashed with science at

various stages of the latter's development. It was with such antecedents that Western science came to India and in the popular mind, it passes for a secular activity tending to disclose facts which are of purely material nature having no significance whatever beyond their sensory appeal. The question of anticipating a marriage between science and philosophy having thus receded into the background, the educated general public of our times are dogmatically clinging to the idea of a gulf between science and religion or science and philosophy where there really exists none.

But there were discerning men who could see the truth. They have always been there, the world over, but unfortunately, their number is usually very small. These wise men neither summarily reject nor summarily accept when something new is encountered. Western Science to India was new. But to discriminate between what was good and what was bad about it needed insight. Whitehead, writing in 1925 observes, "Modern science was born in Europe, but its home is the whole world. In the last two centuries, there has been a long and confused impact of Western modes upon the civilization of Asia. The wise men of the East have been puzzling, and are puzzling as to what may be the regulative secret of life which can be passed from West to East without the wanton destruction of their own inheritance which they so rightly prize. More and more it is becoming evident that what the West can most readily give to the East is its science and its scientific outlook" (P.4, Science and Modern World).

Whitehead's observation is partly an echo of what Swami Vivekananda had said half a century before him. The "confused impact" and the "scientific outlook", both resulting from the advent of Western science in India called for a discriminating analysis. of the situation. The first authentic voice that broke the

ground by proclaiming the scientific character of Vedanta philosophy to the world was that of Vivekananda. It was a two-way compliment: if Vedanta was scientific, science should exhibit trends and facts which agree with Vedanta. Vivekananda declared that the West needed Hindu Vedanta to contain its scientific materialism, whereas India would progress only if it adopted Western science for the amelioration of its poor and ignorant masses. There was a genuine attempt on his part to bring together science and Vedanta in the reconstruction of the India of his vision.

Being a graduate of the Calcutta University, he had clearly understood the meaning of modern science and had realised its potential for restating in a more powerful language the great spiritual truths of mankind, especially as indicated in the Vedanta philosophy.

When Vivekananda represented Vedanta Philo,sophy to the 20th century world in the light of modern knowledge, he was only reiterating what Shankara had systematised from the sources of the Upanishads and the other systems of philosophy posterior in their development to the Upanishads. Thus, the scientific character of Vedanta has an unbroken tradition from the Vedas down to the modern times. Shankara wins his unique place in the history of Indian philosophy, because it was he who rationalised the truths which were intuitively presented in the Upanishads. In the words of Vivekananda, "In the Upanishads, the arguments are often very obscure. By Buddha, the moral side of the philosophy was laid stress upon, and by Shankaracharya, the intellectual side. He worked out, rationalised, and placed before men the wonderful coherent system of Advaita. In Shankaracharya, we saw a tremendous intellectual power,

throwing the scorching light of reason upon everything" (from his lecture "The Absolute and Manifestation", delivered in London, 1896).

Whether it is art, science or philosophy, the fundamental thoughts which provided the impetus to their flowering in various civilizations seem to be of a common stock. As for such a fundamental thought which lies at the base of the scientific movement in Europe, I will present what Whitehead has said on this point, and in order to highlight a similar concept which impressed the early philosophers of India and influenced their philosophical systems, I will draw reference from Dr. Radhakrishnan. Whitehead remarks that there can be no living science unless there is a widespread instinctive conviction in the existence of an Order of things, and, in particular, an Order of Nature. This instinctive conviction is explained as the inexpungable belief that every detailed occurrence can be correlated with its antecedents, in a perfectly definite measure explaining general principles. It is this instinctive conviction, vividly poised before the imagination which is the motive power of research: that there is a secret, a secret which can be unveiled.

In the Indian context, this principle of cosmic order was called Rta, etymologically standing for "course". This cosmic order consisted of both physical order of nature and moral order in the affairs of men. An application of this cosmic principle is further seen in the doctrine of Karma which accounted for man's sufferings or enjoyments as the consequence of his actions. The cosmic order conceived as immutable appears in the logical character of the philosophical propositions which compose Indian philosophy. The law of cause and affect is, of course, at the very heart of all of them. The very process of creation and dissolution of the universe is described as the function of this universal law.

This belief in the rationality of things in nature with little room for arbitrary happenings forms just one phase of the human mind, which engages itself seriously either in discovering the secrets of physical nature or in exploring the spiritual dimensions of man. The other and equally important phase without which reasoning might lead us to barren judgements and cold scepticism is loyalty to facts or experience. Unbridled reasoning disengaged from facts is not helpful in the production of either genuine science of genuine philosophy. The experimental method and attention to "irreducible and stubborn facts", and an active interest in the simple occurrences of life for their own sake are what we should take as the chief factors that led the men of curiosity to produce the great body of scientific knowledge in Europe since the time of Aristotle and Roger Bacon. The genius of the European mind which was disposed to evolve a physical scheme of things could soon realise the antithesis between the deductive rationalism of the scholastics and the inductive observational methods necessary to create genuine science. The empiricist element in scienttfic thinking was opposed to the free reign given to reason in scholastic philosophy. It insisted on the priority of physical facts over abstract reason. As a corollary to its physical emphasis, a new ingredient of modern science which was early injected into the scientific stream of thought was the idea of quantification. Where the philosopher looked for qualitative differences which was sufficient for him to classify things and formulate general principles about nature, the experimental scientist concerned himself primarily with measurable elements among the phenomena and then tried to see relations between these measures of physical quantities. The last mentioned step of seeing quantification as the most reliable technique to attain objectivity in the study of nature marks the transition from Bacon to Galileo and Newton, the former

standing for classifying things and the latter two for measuring them. By the end of the 17th century, the physical method had well entrenched itself in the concept of quantification. What seemed to hold the key to the unlocking of the mystery of physical nature was the measurement of mass, energy, force, distance and velocity involved in the process of change in the physical phenomena.

Now, this approach of the inquisitive human mind searching for the secrets of nature, which came to the fore in the 17th century European science also characterises in its essential form, the philosophic method evolved in India. Inspired by the same concept of Natural Order as was in the case of the scientist, the philosophers of ancient India carried forward their inquiry into truth on a rational basis. But human reason was never accepted by them as the sole guide in their quest for truth. The old Nyaya School whose epistemological formulations came to be generally accepted by all the schools of philosophy has perception coupled with inference to ensure a balance between naive empiricism and extreme rationalism. The basic scriptures of Hindu Philosophy like the Upanishads and the Brahma Sutras caution the seeker against extreme intellectualism and admonish the seeker to compare his conclusions and reflections with those of others who are recognized authorities in the field. Besides the facts of ordinary perception (Pratyaksha), most of the schools of Indian Philosophy approve of another channel of human knowledge known as "alaukika pratyaksha", which is intuitive perception. If physical sciences look for irreducible and stubborn facts even as they proceed to see connections among them and arrive at generalisations by the exercise of reason, the Vedanta philosophy on its part includes the intuited religious experiences as a major datum in the construction of its theories. Here, the glaring

difference between the post-Cartesian Western philosophy and Indian philosophy lies in the former's exclusion of intuitive religious experiences. The various models evolved by the rationalist, empiricist, idealist, or realist schools of Western philosophy are no doubt grand edifices of intellectual curiosity, but they fail to satisfy the deeper demands of the soul in so far as they fall short of indicating a transcendental reality of perfection beyond the bounds of the fragmentary human reason. Western science has progressed because it discarded the unbridled rationalism of medieval scholasticism and combined the empiricist concern for observed facts with intellectual abstractions. However, the same may not be said of Western philosophy. Intens~ve experience of a supersensuous variety is a part of the Indian philosophical tradition, but not of the Western philosophy. Also, the term religion substantially differs in its connotation in the two cultures. In the West, the term stands for theology and institutionalised forms of worship, whereas in the Indian context religion is essentially suggestive of the intuitive experience of a supersensuous and impersonal truth. In a certain sense, it is mysticism, because religious experience is always private and it occurs to the individual. But actually it is more than private because it is a common experience .obtained by all mystics or yogis allover the world irrespective of their religious affiliations. The scriptures, for example, the Vedas, are regarded in most Indian philosophical systems as an additional source of knowledge besides perception and inference. The idea here is that the Vedas are a record of religious experiences of the sages who had purified their inner mechanism of knowledge to receive the supersensuous light of the Divine. And whatever was thus revealed to individuals had also to be acceptable to the best minds (mahajana) of the community. Prof. Hiriyanna observes, "Thus, the standard here

becomes eventually a society of men, and not an individual; and by virtue of the status which it thus acquires, its deliverances are taken to possess an authority which cannot belong to those of anybody's private intuiţion. Vedanta, and even Mimamsa are the systems that accept "revelation" in this sense, as the means to a knowledge of supersensuous truth.

The goal of philosophy was determined in India as everywhere else to be the knowledge of the ultimate reality of all things. But this high altitude of the last stage did not make the philosophers miss the importance of starting from the lowest step of sensory knowledge. All philosophy has to begin with an explanation of what is obvious and common. The most obvious and common in all our knowledge are the things which present themselves to us through our senses. That is where science starts its search for the understanding of things and that is where philosophy begins its inquiry into things and the nature of our experience. Inference, reason and logic, for all their apparent certainty and reliability were never seen as processes totally independent of perception in extending our knowledge. Reason can criticise, analyse, coordinate or evaluate what is given in perception, but it is not credited with the function of giving us new knowledge. Neither science nor Vedanta grants this role to reason. On the other hand, conclusions arrived at by reason must be in agreement with the facts observed by the senses; if this is true of science, it is equally true of Vedanta. Only in the case of the latter, the concept of "the facts observed" is further widened to include certain other forms of experience, and this latter term is inclusive of mental as well as spiritual experiences which satisfy the standard of objectivity as explained above. What distinguishes Vedanta from science is this admission of psychic experience common to all human nature, and the inclusion of the intuited

experience of the saint. But Vedanta is not any the less of a science because it is also dealing with the experiences which the sciences leave over. The notion of certainty in knowledge attached to sense perception -no matter this knowledge is given only a symbolic representation in the scientific system -is almost an axiomatic belief on the part of the scientists. In the intuitive experience of spiritual character, the highest form of knowledge man is capable of rising to, the quality of directness which characterizes sense perception is repeated. The Vedantin would never accept the mere speculative conclusions regarding the ultimate reality unless such conclusions are capable of being rendered into facts of experience. In accordance with the above analysis, what is directly perceived with the senses is called pratyaksha, whatever is inferred by the application of reason is paroksha, and that extraordinary, but not private and uncommon for that matter, knowledge gained by intuition developed by going through a course of self-purificatory discipline is called "aparoksha anubhuti", i.e., experience of some non-indirect kind. This experience is different in its nature from direct sensory knowledge or indirect rational knowledge, and is therefore called non-indirect knowledge! The double prefixes attached to the stem 'aksha' (vision) signify the transcendental and yet the direct nature of this experience.

The high conception of philosophy as the culmination of all knowledge demands that the theories of philosophy account for all the levels of knowledge -sensory, rational and intuitional. Thus, the status of philosophy is not to be equated with that of any separate and individual science. Whitehead's account of the place of philosophy as against individual sciences is worth quoting.

"Philosophy is not one among the sciences with its own little scheme of abstractions which it works away at perfecting and

improving. It is the survey of sciences, with the special object of their harmony, and of their completion. It brings to this task not only the evidence of the separate sciences, but also its own appeal to concrete experience. It confronts the sciences with concrete fact". (Page 108, Science and the Modern World).

The concrete fact with which philosophy confronts science is, according to the Upanishads, that it comprehends "that Reality by knowing which all this becomes known" (Mundaka). Such a reality does not remain as an exclusive fact of Vedanta; it is the basic fact forming the core of every branch of science, for it could be seen as having a unique relationship with all scientific facts. The great scientists of our time have begun to read the hidden message of their own discoveries in the field of science, which suggest the Upanishadic concept of Reality "by knowing which all this becomes known". Einstein speaks, for instance, for the whole of his community in the following words:

> "Everyone who is seriously involved in the pursuit of science becomes convinced that a spirit is manifest in the laws of the universe -a spirit vastly superior to that of man and one in the face of which we with our modest powers must feel humble".

The object of inquiry in Vedanta, says Shankaracharya, is Brahman, the First Cause of the Universe which is bound by the laws of time, space,and causation, and is inhabited by conscious living beings. This means that it should account for the existence of both matter and consciousness. In its methodology, Vedanta confines its analysis of matter to the sensory level (pratyaksha), and resorts to reasoning (anumana) and introspection in order to study both matter and consciousness and decide upon the question of their reality. Physical sciences however, concern themselves

with the exploration of the world of matter for its own sake, and claim to have adopted the objective methods in their study of nature. Here it was believed that it would be possible to keep the subject and object (or the observer and observed) apart and arrive at a wholly objective concept of reality. One such typical objective model of the universe, for instance, is sought to be provided by a branch of physics called classical mechanics. In this model of the world, space and time are regarded as an external background against which material particles move and interact. Space, time and matter were regarded here as absolute entities existing independently of one another and having inherent properties which were not determined by the presence of the other two.

However, with the advent of the theory of relativity and quantum mechanics' the situation has taken a new turn, and the world model envisaged by the scientists seems to demand a rather holistic approach in which space and time, or rather spacetime, is no longer regarded as a mere passive background. Space, time and matter, under. the general theory of relativity came to be comprehended as one unified system forming a dynamic model of the world. The absolute space and absolute time of Newton, which were only notionally so, are now found to be relative since their measurements depend upon the choice of the observer, or the frame of reference. This gave rise to the notion of subjectivity for the first time in a physical theory driving the physicists to reassess the foundations of their discipline, which they thought had been firmly laid on the principles of objectivity. A similar contingency arose but in a somewhat different situation, when in quantum mechanical experiments, the process of observation was seen to interfere with the phenomenon observed, frustrating the hope of attaining complete objectivity in our understanding of nature. Within the frameworks of the relativity theory and

quantum mechanics we have thus encountered a curious situation where the observing system, instead of remaining a passive means of observation, becomes an active determinant factor in the measurement of the object, thus revealing a new dimension of the subject-object relation.

What we call observer is an evolving concept according as the objectives set up and the restrictions imposed upon the methodology in a particular mode of inquiry. Under a single general term "observer" we use space and time as frame of reference in the theory of relativity, and the measuring instrument in quantum mechanical experiments. In all commonsense perception, we ourselves act as the observing system through our mind-body complex, whereas in Vedantic parlance the observer is identified as consciousness in its exclusive role as a detached spectator or witness (sakshi). In every form of empirical science, the observer or the frame of reference has also to be empirical, in the sense that it must be possible to define it in terms of precise measurements, and it is this condition, which of late, has failed to fulfil itself in experiments where we deal with the quantum phenomena. Vedanta parts company with physical sciences at the point of defining the observer, since it assigns every conceivable means of perception into the sphere of the object, and holds, in the ultimate analysis, pure consciousness in its non-interacting and non-relational form alone as the true subject or observer. The terms "pramatr" and "sakshi" (the former who sees through the complex of the psycho-physical mechanism, and the latter who is a pure witness mark the two ends of the spectrum of the observer as formulated in Vedanta. The concept of frame of reference (Observer or subject) as used in physical sciences is certainly a novel device not included in Vedanta since it is an artificial cut-out made within the objective domain itself. Nevertheless, we do

see that the concept of an ideal 'observer prevailed in science as in Vedanta, and a frame of reference which would not interact with the phenomena it measured, was conceived as a logical necessity for an objective study of nature. Such an idealised view of the observer is common to both Vedanta and science in the fulfilment of which Vedanta recognized the existence of a Sakshi principle (pure witness) within us, and science postulated an absolute space and an absolute time as in Newtonian physics, or an inertial frame as in relativity physics. However to realise an ideal frame of reference in terms of a material objcet has its own problems and only to a degree of approximation this is found to have been fulfilled in actual practice.

Despite such commitments to the principle of objectivity, the present developments in the physical sciences clearly demonstrate the unattainability of a complete picture of reality even in principle within a scheme of investigation where subject and object are supposedly split into two unrelated and independent entities. For example, the space-time frame of reference of the relativist is not separable in principle from the psychophysical mechanism of perception of which we are constituted. Our body is made of physical matter and mostly follows physical laws, and our mind measures up to the concept of physical space and time in its interaction with the external world. This is illustrated by the supposed space-traveller's complete adaptation to the phenomena of time-dilation and length contraction. The Here-Now in Minkowski's model of the absolute world becomes relevant by the fact that we as observers are attached to material bodies which are always localised in some point of time (a Now) and space (a Here).

The observer sees what his physical senses and his space-time coordinates impose upon him: his retina itself suffers Lorentz

contraction and the contraction of the object is concealed from him (cf. proper length). His heart, which is a kind of biological clock, slows down just as the mechanical clock placed by his side does (cf. proper time). The consciousness in the observer and his physiology are mixed up in the sense of superimposition (Shankara's Adhyasa). This mixing up of the Self and the non-self, of the real and the unreal, is so thorough that he is oblivious of the physical changes taking place in accordance with his space and time coordinates. Our empirical consciousness is demonstrated here to be a function of the material frame which our body is. Our body is again shown to function in an inseparable manner from the space-time frame of which it is a part itself. The relativistic effects of.matter in motion is impressed upon the mind too since the latter does not function independently of the nervous system which mediates the external object. Our empirical experience is thus reduced to frame-bound observation.

This remarkable revelation of the fact of mutual super-imposition between the body and the self (consciousness), one of the basic epistemological principles of Advaita Vedanta highlighted by Shankara -comes to us in the Michelson-Morley type of experiment in the relativity theory. Such a coincidence between the physical science and the spiritual science of Vedanta is not accidental but normal. In the absoluteness of the velocity of light (the analogue in Vedanta is pure consciousness), in the function of space and time as reference frame (upadhis), in the rejection of causality in the deterministic sense in the wake of the principle of indeterminacy (Maya), in the laws of conservation and entropy (the concept of Avyakta and the cyclic view of creation and destruction), we have parallel concepts ev~lved on the Vedantic side about a different domain of human experience and stated in a different language. How are we to understand that

they are the same concepts in Vedanta as in science when the languages of the two are different? We accept such sameness on the principle that a concept is the same when the function attached to it is the same, notwithstanding the fact that by definition, we have separated their respective domains for the purpose of analysis and study.

Philosophy and science first came to be defined separately by Sir Francis Bacon, who may be said to have laid the methodological foundations of modern science. This has proved to be a very fruitful achievement in that it has yielded, as we see, a rich harvest of knowledge about nature in the form of our modern Western science. In India, such a separation between philosophy and empirical science was not, at least in spirit, if not in actual study of external nature, envisaged, and a continual effort at the synthesis of the empirical and spiritual dominated the scene of philosophical speculation. The Indian' genius busied itself with the synthesizing task of all knowledge, by which it has always successfully guarded the image of reality in its wholeness. In this process, I should like to emphasize that the measure of objectivity which Vedanta has brought to bear upon its system of knowledge is not, as it is likely to be presumed, less but more than the degree of objectivity achieved in science. Logic, reason, imagination and a sense of supreme detachment -this, in spite of Vedanta being a system intrinsically permeated through and through by moral values, —which have played a decisive role in ensuring the merits of science as a dependable body of knowledge, have found an equally high place in the construction of the Vedantic system. In sum, our claim is that Vedanta philosophy as contained in the Upanishads and as logically expounded by Shankaracharya embodies all those features which one understands to be necessary for masking a system of knowledge scientific. Whenever such

correspondences between science and Vedanta is not found, it must be understood to have been dictated by the nature of the subjects the systems have undertaken to explore. Accordingly, there are no quantitative relations defined among the categories of Vedanta as in science. Hence, there is no mathematics used in the exposition of the system. This has not, however, precluded the use of mathematical logic in the Vedantic system. For example, the system of coordinates is something basic to the theory of relativity and it assigns definite measure numbers to these coordinates of space and time. In Vedanta, the concept of coordinate systems is as basic to its theories as it is to science, and they are as well defined, but the choice of the coordinates is naturally directed by the phenomena to be investigated. Thus, we mayor may not have space and time as basic coordinates in the description of facts; nevertheless, we do have coordinates of a different order. The reality for Vedanta is not confined to the order of space and time as for science. Vedanta has to go beyond these phenomenal categories to discover what underlies these physical concepts. In such a pursuit, the choice of coordinates differs, and space and time yield place to those higher and more inclusive orders of reality for which these become rather objects of perception, and not as in physical sciences, the means of observation and measurement. Rooted in consciousness as its centre for its all- inclusive study of phenomena, Vedanta finds space-time coordinates inadequate for its purpose, and therefore, it employs physiological and psychic instruments (senses,' mind, and different states of consciousness) as coordinate systems in relation to which the function of a pure and impersonal consciousness is plotted. Behind these variously coordinated functions of consciousness in man, there is the postulate of an impersonal, absolute, and ever-free consciousness, which, being

beyond space and time transcends the notion of the object (the observed), and being beyond mind and speech transcends the notion of the subject (the observer).

The fundamental question raised in every form of philosophical inquiry is how we might explain the relation between consciousness that knows and the object that is known. In common parlance, this is often spoken of as relating mind and matter. Every form of answer to this question tends either in the direction of reducing mind to matter or matter to mind. The greatest fact to reckon with about the physics of our times is that it clearly tends to reduce matter to the model of mind, and not vice versa as physics itself had tended to do in its early phase of developing a mechanistic model of reality. This idea of reducing the physical world to the model of a mental reality, or, to be precise, to the model of consciousness has been the central theme of Vedanta, which it has been propunding within a framework of reason and logic ever since the time of the Upanishads. The most exciting fact in the world of knowledge today is that this theme of unity between mind and matter, or, in the epistemological terms, between the observer and the observed has been most fruitfully brought forth by the experimental methods of physics, which inclines us to view modern physics as a powerful commentary on the ancient thought system of Vedanta. Reasoning is one method of exploring the truth in the somewhat confused world of experience, while experimentation is another. It is true that experiments are often designed on some pattern provided .by reasoning, and reason, when developed on the strength of experimental results stands on surer grounds than it would on merely abstract logic. If we suppose that there were no controlled physical experiments of the modern type in the days when the

sages of the Upanishads gave their verdicts on the nature of man and the universe, we should all the more be astonished at the amazing agreement of the Vedantic view of the physical world with that of modern physics.

Besides this similarity in the one great conclusion about the nature of matter, there is, between Vedanta and physics, a common pattern in their essential approach to the question of reality. Both disciplines proceed along with the principle of causality in their analysis and the sorting of the issues as long as they can hold on to the concept of objectivity. But the causal principle seems to reach the end of its tether in both the disciplines at a point when the subject-object interaction begins to force itself as a factor to be reckoned with in determining the results of observation. This new situation forms a part of relativity theory and quantum mechanics in physics, and it constitutes the very essence of the theory of knowledge (Adhyasa) in Vedanta. The concept of superimposition, especially, the superimposition of the object over the subject and of the subject over the object, holds the stage hereafter in all processes of the search and explanation. The first face of inquiry in both the disciplines holds the object in its independence from the subject (take for instance, classical physics and the Vaiseshika-Samkhya views of the physical world), whereas in their advanced stages, both Vedanta and physics include the subject or the conditions of observation as an integral part of the observed system. The theory of super- imposition or superposition, whether in Vedanta or quantum physics, is directly connected with the question of where to draw the dividing line between the observer and the observed in a really indivisible system of observation where both existence and knowledge stand fully integrated in the unity of meaning.

In yet another way of analysing human knowledge, we find the theme of appearance and reality, or the relative and the absolute being given a fundamental place in the methodologies of both physics and Vedanta. Even in physics, which presumes to explore an objective reality in its attempts to understand the nature of the physical world, it is unambiguously shown that knowledge of the object is sharply defined by a frame of reference, but at the same time, no frame of reference is absolute. The absolute frame of reference not being available in terms of either space or time, but only as spacetime, it turns out to be an abstract mathematical construct, and an idealization, lying beyond the domains of human perception. Modern physics has thus, in the theory of relativity, as well as in the case of quantum physics, introduced alongside the empirical world of perception, a realm of transcendental reality not unrelated to the former, but actually derivable from it. In these startling revelations of certain transcendental dimensions of reality behind the obvious and the empirical world of space and time, modern physics compares well with Vedanta, and comes to attain a certain metaphysical significance, which can no longer be ignored by the seekers of knowledge.

If the tracks on which Vedanta and science (mainly physics) are proceeding lie in the same direction, as we have been seeing so far, what is it that keeps them apart? It is the territory on which they run, the ground they cover, that are different. It is a single common track otherwise, of which one part is laid in continuation of the other. I will use a metaphor to drive home my point. On the open plains, our scientist's huge locomotive runs on. broad gauge pulling a long train loaded with the vast knowledge of the world around. The track on which it is presently running will, however terminate by a hillside station. The onward journey is a

climb, a continuation of the previous section, but with a change of track. This section of the track is laid on a narrow gauge, and you have to shed much of the load you have been carrying before you enter upon this new phase of your journey.

The change of track is the change from the science of matter over to the science of spirit. It has been the exploration of matter with the help of consciousness so far; it will be the exploration of consciousness in itself henceforward, which means that it will be a study of the chief apparatus which we have been using so far in our scientific investigations paying no special attention to its nature and composition. The institution of this further study is one of fundamental research, and demands better discipline and an inward dedication on the part of the researcher.

As the scientific train arrives at the broad-gauge terminus, a deep and earnest voice is heard making an announcement.

It is the sage of the Upanishads, who is in charge of the hill section of the journey, that is speaking:

> "Give up all other talks now! You have to know that Self alone, which is one without a second, and on which are strung the heaven, the earth, and the inter-space, the mind and the vital forces functioning in living beings together with all the other organs. The bridge you are going to cross is the one that is leading to Immortality!" [4]

This "new" epistemology of the sage of the Upanishads is clear: we have to bring the object and the means with which we know the object under one principle. this will not fail to have its appeal to the quantum physicist, for he is just being confronted with a similar problem in his new atomic lab!

Looking from the hill top, you can command a wider view, see the entire length of the track you have covered, and draw a sigh of relief that in spite of the atom bomb and the star-war, the long and sustained struggles of mankind in its journey through the path of science will not be in vain, because you know that those who board the scientific train will eventually change their track and meet you some-day on the hill of Vedanta, the summit from where one can see all around and know everything!